INSIGHT

TAPPING INNOVATIVE SOLUTIONS & TECHNOLOGY AT JOHNS HOPKINS MEDICINE

MAY / JUNE 2017 PUBLISHED BY JOHNS HOPKINS MEDICINE MARKETING AND COMMUNICATIONS

Anatomy App Offers Interactive Learning from Johns Hopkins Expert

Anatomy professor Christopher Ruff says there's a funny thing about mobile apps meant to educate students on musculoskeletal anatomy: A lot of the anatomy images used are wrong. That's why Ruff is excited about a new 3-D musculoskeletal app produced by Johns Hopkins Medicine and biomedical visualization company BioDigital.

"It's flexible, dynamic—and accurate, which are all important aspects for the market it's aimed at," says Ruff, the science consultant to Muscle Anatomy: A Johns Hopkins Medicine 3D App. "For someone who wants to understand how, say, a thumb works, that's critical."

Aimed at students, doctors, artists, forensic scientists and even archeologists, Muscle Anatomy, as it's also known, launched in March. It boasts more than 3,000 anatomy structures grouped into four regions: head and neck, upper limbs, trunk, and lower limbs.

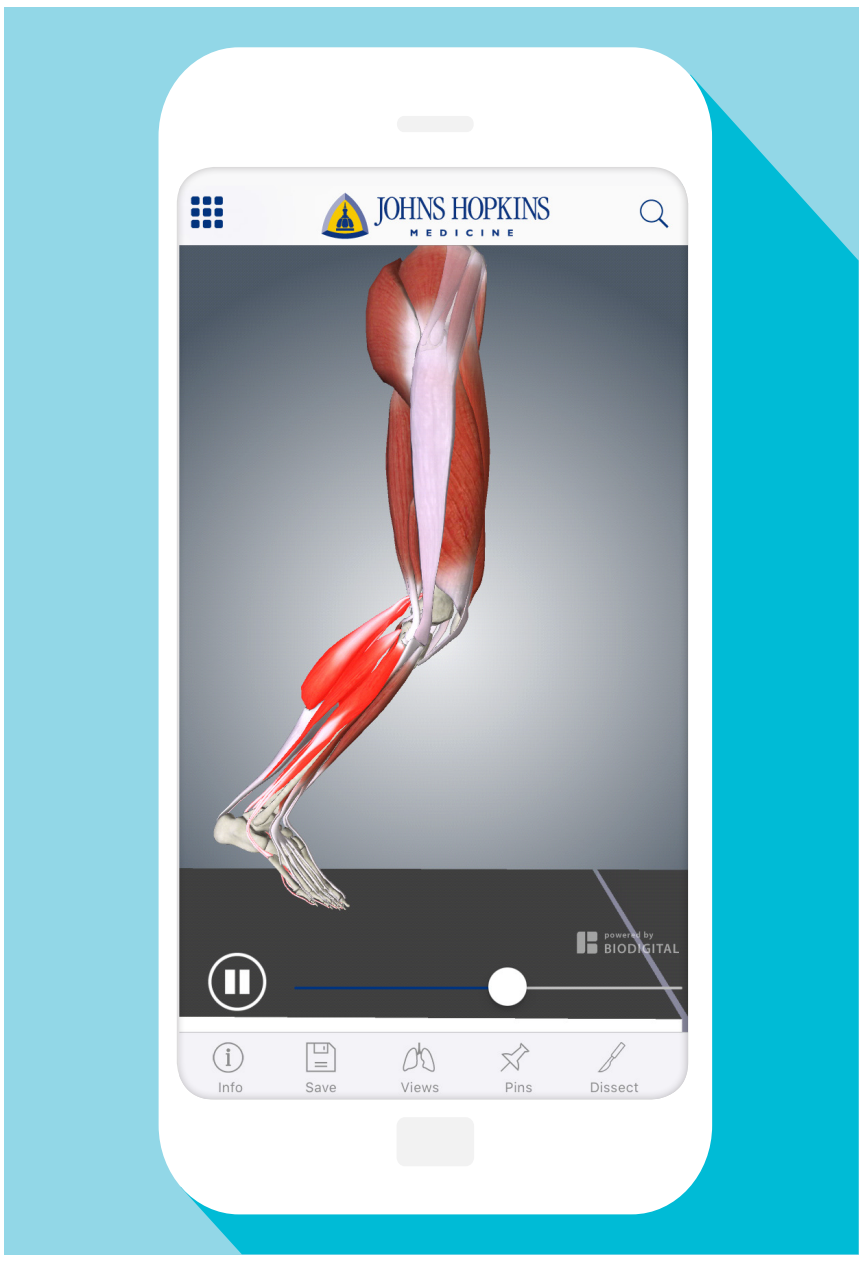
Users can spin, tilt, dissect, write on and highlight different areas of the body. They can also tap on anatomical labels to reveal educational information or use the 'X-ray option' to see a more transparent version that reveals three-dimensional positioning. Animated 3D models show the movements of muscles and bones in activities like raising an arm.

"For instance, when someone walks, the muscles that become active at different parts of the gait cycle will light up in the model," explains Ruff.

It took nearly two years to bring the app to market. A Johns Hopkins medical and biological illustration graduate who now works at BioDigital contacted Ruff for feedback on musculoskeletal renditions; the idea for the app came shortly after. The anatomical renditions were pulled from BioDigital's image stock and meticulously reviewed and enhanced based on feedback by Ruff.

"Getting everything to look exactly right and correctly positioned was the biggest challenge," says Ruff.

The app is available for $9.99 for iOS operating systems.



ANDRE DALOBA / MARLENA AGENCY

Database Could Lead to Better Diagnoses of Brain Anomalies in Children

Researchers are testing a database of more than 10,000 pediatric MRI scans of Johns Hopkins patients to help physicians and researchers better detect brain anomalies in children.

The idea behind the project is to create a Google-like search system that matches a patient's MRI scan with similar scans in the database. After obtaining the matches, a physician can request the de-identified medical records of those patients.

"Our technologies allow you to group children based on their MRI scans," says biomedical engineer and Center for Imaging Science Director Michael Miller, who is leading the project along with Susumu Mori, professor of radiology, and Thierry Huisman, director of imaging and imaging science at Johns Hopkins Bayview Medical Center.

Mori says the team faced several challenges in creating the database, including converting the MRI data into meaningful information that can be understood by computers. "We have to teach computers what is important and where the important structures in the brain are," notes Mori.

For the latter, the team of engineers and radiologists used Johns Hopkins-developed software called Brain GPS to analyze each brain image. The software converts the images into bar code-like data and then organizes the information based on anatomical abnormalities related to 22 major brain disease categories, including chromosomal abnormalities, congenital malformations, vascular diseases, infections, epilepsy and psychiatric disorders.

The database, which can only be accessed by Johns Hopkins physicians and researchers via several institutional supercomputers and from behind the Department of Radiology and Radiological Science's firewall, is now being tested by radiologists for its accuracy.

It continues to have new pediatric brain MRI scans and related patient information added every two weeks.

The project was supported by a recently completed three-year $600,000 grant from the National Institutes of Health and is now being funded by a grant from the National Institute of Biomedical Imaging and Bioengineering.

TECH/ENVY

A look at innovative developments outside the halls of Johns Hopkins Medicine

For Clinical Specialists

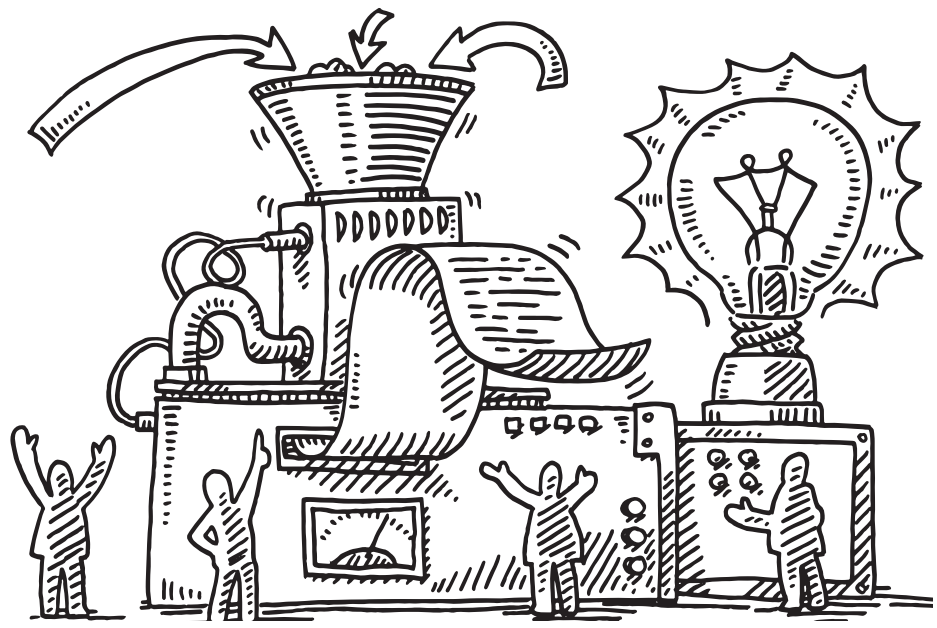
Emergency video telemedicine supports Mayo Clinic community providers during high-risk newborn deliveries. Neonatologists consult with local providers to perform newborn resuscitation, including ventilation, endotracheal intubation and other lifesaving procedures. Because the neonatologist can see the baby and provide remote-guided care, the technology could prevent the transfer of patients to the neonatal ICU and allow babies to remain with their parents at the local hospital.

An ambulance at Rush University Medical Center incorporates telemedicine technology and a CT scanner to accurately diagnose and treat stroke. Traditionally, patients cannot be treated for stroke until they arrive at an emergency room. The mobile unit enables an emergency medical technician and critical care nurse to perform CT scans and, using telemedicine, consult with neurologists who evaluate the patient and decide what kind of treatment is indicated. The technician and nurse can then administer the medication at the same time they transport the patient to a stroke center.

Surgeons at Stanford Medicine are utilizing a magnet-driven device for laparoscopic gallbladder surgery that requires fewer incisions than the traditional approach. The device includes a clip on the gallbladder and an external magnet to retract the gallbladder. Through use of the tool, surgeons make fewer incisions to insert the instrument to retract the organ. Removing the gallbladder is an especially challenging procedure due to its proximity to the liver.

Johns Hopkins Leaders Meet to Harness Precision Medicine

Big data offers the potential to transform the practice of medicine. To this end, several data experts met with Johns Hopkins Medicine leaders to focus on how to best tap data at an academic medical center.



"People walked away energized," says Antony Rosen, vice dean for research in the school of medicine, about the two-day meeting. "Data can help us discover better, educate better and treat better."

One meeting day covered precision medical care; the other focused on precision medical education. Topics included:

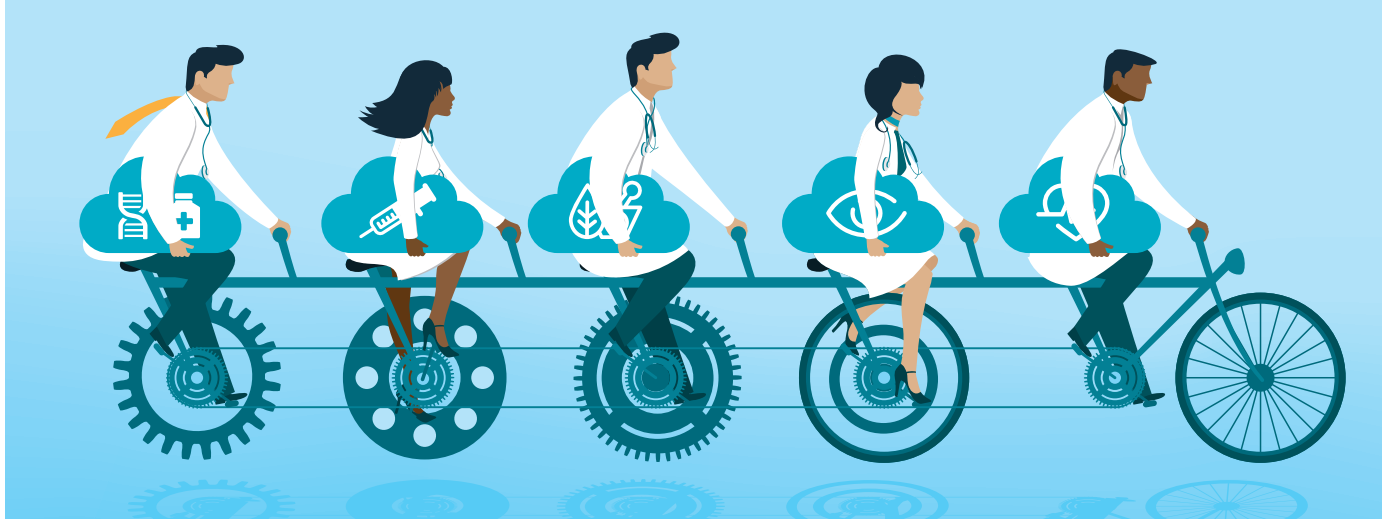
1. How to use data to change health care, presented by guest speaker Eric Horvitz, technical fellow and managing director for Microsoft Research, and Stephanie Reel, chief information officer for The Johns Hopkins University
2. How artificial intelligence and deep learning are informing patient diagnosis and management, presented by Shahram Ebadollahi, vice president for innovations and chief science officer for IBM Watson Health Group; Peter Pronovost, senior vice president for patient safety and quality for Johns Hopkins Medicine; and Johns Hopkins computer science engineer Suchi Saria
3. The importance of using data to define patient subgroups while recognizing biological variation will always exist, presented by guest speaker Robert Califf, former commissioner of the Food and Drug Administration; Johns Hopkins biostatistician Scott Zeger; Johns Hopkins systems architect Alan Coltri; and Antony Rosen
4. Data tools that can help prevent unintended variation in clinical care, presented by Earl Steinberg, chief executive officer for xG Health; Redonda Miller, president of The Johns Hopkins Hospital; and Peter Greene, chief medical information officer for Johns Hopkins Medicine
5. How education can be reinvented and personalized for graduate and medical students using data, presented by Roy Ziegelstein, vice dean for education; Peter Espenshade, associate dean for graduate biomedical education; Nancy Hueppchen, associate dean for curriculum; and Harry Goldberg, assistant dean, all of the school of medicine

Participants compiled a list of insights and recommendations that are being prioritized for implementation.

WEB EXTRA: Learn more about the experts at the meeting by clicking on this article at hopkinsmedicine.org/insight.

Incubator Grows Johns Hopkins Software to Improve Patient Care

It was the day she had been waiting for. Five teams assembled by the Technology Innovation Center (TIC) were presenting their 16-week-old software solutions and business startups to a panel of experts for feedback.



"I attended the presentations and was blown away by the amazing ideas," says Dalal Haldeman, senior vice president of marketing and communications for Johns Hopkins Medicine.

Currently in its second year, the Health Experiential Clinical IT Entrepreneurial (HEXCITE) program builds and mentors teams that include clinical, technical, design and business leads. At the end of the HEXCITE program, teams are ready to build their solutions with the TIC, conduct a pilot in a clinical space and launch a startup.

"The feedback and comments from industry leaders on how to move the solutions forward were excellent," says Haldeman.

Software solutions included the following:

- A **mobile app** to help providers decide on the best antibiotic treatment for infections and decrease the overuse of antibiotics. The innovation could improve care and save millions.
- A **30-question, 30-minute web-based measure** to help caregivers screen for autism in children. The program provides narrated video vignettes to assist in recognizing symptoms so appropriate care can be administered.
- A **dashboard** that provides a summary of a hospital patient's current and historical health status, consolidating information from various sources to show trends in a patient's heart and respiration rates, temperature, mean arterial blood pressure and oxygen saturation.
- An **interactive website** and mobile app that recommend next steps and the expected outcome for a lump in the thyroid gland. The innovation aims for a quicker and more accurate diagnosis.
- An **interactive program** for clinicians to document gastrointestinal anatomy after a medical procedure and to store a corresponding 3-D image in the patient's electronic medical record.

WEB EXTRA: Learn more about the HEXCITE program by clicking on this article at hopkinsmedicine.org/insight.